MEDG 421: Genetics and Cell Biology of Cancer

6 Jan 2025 – 9 Apr 2026

Time and Location:

Lectures are 9:30am-10:50am Tuesdays and Thursdays in the **Hugh Dempster Pavilion (DMP) | Floor: 1 | Room: 101**.
https://learningspaces.ubc.ca/classrooms/dmp-101/

Instructors and Contacts:

Instructors

Dr. Laura Evgin	levgin@bcgsc.ca
Dr. Ewan Gibb	ewan.gibb@ubc.ca
Dr. Morgan Roberts	mroberts@prostatecentre.com
Dr. Gregor Reid	grogreid@mail.ubc.ca

TA

Nathalie Longakit	nathalie.longakit@ubc.ca

Program administrator

Azin Zeinali	medical.genetics@ubc.ca

Course Description and Objectives:

This course provides a comprehensive overview of cancer biology, spanning the fundamental principles of tumor initiation through to clinical and research applications. Students will explore the molecular and genetic basis of cancer, including oncogenes, tumour suppressors, cancer cell signaling, and the hallmarks that define malignant transformation, alongside key processes such as tumour invasion, metastasis, hypoxia, and interactions within the tumour microenvironment. The first modules are designed to equipe students with the foundational knowledge to understand in detailed features and various types of cancer in the latter modules.

A background in cell biology is assumed - **a grade of B or higher in BIOL 335 is strongly recommended**. It is assumed that students will have a firm understanding of cell biology and basic genetics, as such knowledge will be critical to the course material.

Due to the fast-paced nature of the area, material will be largely taken from recent journal publications and wherever possible presented by guest lecturers who are experts in a given topic area. This format should provide not only the facts of a research topic, but also highlight cutting-edge research approaches used by cancer researchers in Vancouver. Students are expected to develop skills in both searching and interpreting scientific literature through assigned class readings and paper summaries. The midterm and final exams will be problem-based. In addition, a book club style-discussion and an oral paper summary are designed to promote interaction and communication.

By the end of the course, students are expected to:

- Explain core principles of cancer biology by describing the molecular, cellular, and environmental mechanisms that drive cancer initiation, progression, and metastasis across diverse cancer types.

- Critically evaluate experimental, genomic, and clinical data used in cancer research and oncology practice, including models, biomarkers, and analytical methods that inform diagnosis, prognosis, and treatment decisions.
- Describe the biological rationale underlying modern cancer therapies by linking tumour genetics, epigenetics, and immune interactions to the design and limitations of targeted and immune-based treatments.

Text Book:
"The Biology of Cancer" by Robert A. Weinberg is available at the library, however it is not necessary. Most of the readings will come from assigned recent journal articles and reviews. Links to all assigned readings and course material will be posted on CANVAS.

Lecture Schedule and Material:

The class is organized into two blocks (divided by the midterm and reading week). Drs. Evgin and Gibb will co-lead the first block. Drs. Roberts and Reid will co-lead the second block. The lectures are grouped into the following themes:

1- What is cancer? (covered in Block 1)
2- How do we study cancer? (covered in Block 1)
3- How do we treat cancer? (covered in Block 1)
4- In depth: cancer features (covered in Block 2)
5- In depth: types of cancer (covered in Block 2)

The first block will aim to give an overview of the central concepts of cancer cell biology and genetics, as well as tools to study and treat cancer, thus providing a foundation of knowledge for the more specialized information in the subsequent block. As the course relies on guest speakers, we have tried our best to schedule the themes together, however due to speaker availability, there are some themes where the lectures are not sequential.

Please see page 4 for the schedule. It is possible that speaker order will change as the term develops due to availability.

Lecture slides will be posted on the CANVAS class website either before of after the lecture (although 1-2 lecturers may not release their slides). Students may request assistance from the TA or instructors (contacts above) if they require additional support.

Grading Scheme:

Paper summaries:	**20%** (Breakdown: 2%, 6%, 6%, 6%)
Oral paper summary:	**10%**
Book report/participation:	**20%**
Mid-term exam*:	**25%** (covers first half of the term)
Final exam*:	**25%** (non-cumulative – covers concepts from second half)

*Both the mid-term and the final exams will be in-person and open-note.

Assignments:
Assignment details, due dates, and grading will be done on CANVAS. Below are guidelines for the assignments but for more details see CANVAS.

Paper Summaries:
The first assignment is intended to provide you with feedback prior to the submission of subsequent reports. It will be weighted less than subsequent summaries in the marking. Before submitting a summary for a paper, you must register your choice using the class online registration page, as each paper may only be chosen by one student.
A link will be provided for you to register your paper. You cannot summarize the same paper as another student, so register your paper selections by Pubmed ID.
Late submissions will be penalized by 10% for each 24-hour period past the deadline (including weekends).

Oral paper summaries:
Oral paper summaries will take the form of a 5-7 minute presentation to a small group on the last day of class. More details on this will come later in the term.

Book Report and Discussion Participation:
Students will be asked to read part of a popular science book on cancer. Students will select either *The Emperor of All Maladies* by Siddhartha Mukherjee, or *The Immortal Life of Henrietta Lacks* by Rebecca Skloot. Mid way in the term (February 24th), we will hold a book discussion day, in which we will split into discussion groups to explore the topics raised in this book. Each student will be required to submit a two-page book report prior to this class session. Links and details for this event will be discussed in class.

Disputing marks:
If you choose to dispute an assigned mark, you must submit the assignment or exam for re-grading **with a maximum 1-page explanation/justification of your disputed mark.** The entire work will be re-graded. Please note that in the past the re-marking has led to a net decrease in the assigned grade in some cases. If there is a mathematical error (i.e. we fail to add numbers correctly), you may bring it to the attention of the TA or instructor without a formal dispute.

#	DATE	DAY	TOPIC	LECTURER	LEADER	Assignments due
1	06-Jan-26	Tuesday	Intro and the nature of cancer (including the hallmarks of cancer)	Laura Evgin	Evgin	
2	08-Jan-26	Thursday	Cancer origins and progression (including oncogenes, tumour suppressors, multi-step oncogenesis)	Laura Evgin	Evgin	
3	13-Jan-26	Tuesday	Overview of cancer treatments	Laura Evgin	Evgin	
4	15-Jan-26	Thursday	Research/and analytical methods	Morgan Roberts	Roberts	Paper summary 1
5	20-Jan-26	Tuesday	Cancer genomics	Ewan Gibb	Gibb	
6	22-Jan-26	Thursday	Cancer models	Gregor Reid	Reid	
7	27-Jan-26	Tuesday	Biomarkers	Alex Wyatt	Gibb	
8	29-Jan-26	Thursday	Immunotherapies	Amanda Li	Gibb	Paper summary 2
9	03-Feb-26	Tuesday	Precision oncology	Rebecca Deyell/ Rod Rasswekh	Gibb	
10	05-Feb-26	Thursday	Cancer immunology	Laura Evgin	Evgin	
11	10-Feb-26	Tuesday	Clinical pathology and biobanking	Jonathan Bush	Gibb	
	12-Feb-26	Thursday	MIDTERM	-	Evgin	
	17-Feb-26	Tuesday	READING WEEK			
	19-Feb-26	Thursday	READING WEEK			
	24-Feb-26	Tuesday	Book club discussion	-	TEAM MEDG421	Book report
12	26-Feb-26	Thursday	Sex differences and cancer	Morgan Roberts	Roberts	
13	03-Mar-26	Tuesday	Tumour Invasion and Metastasis	Karla Williams	Roberts	
14	05-Mar-26	Thursday	Pediatric Neuro-oncology	Sylvia Cheng	Roberts	
15	10-Mar-26	Tuesday	Spatial Biology - Lung cancer	Katey Enfield	Roberts	Paper summary 3
16	12-Mar-26	Thursday	Hypoxia and solid tumours	Kevin Bennewith	Roberts	
17	17-Mar-26	Tuesday	Tumour Microenvironment	James Lim	Roberts	
18	19-Mar-26	Thursday	Pediatric cancer + epigenetics	Gregor Reid	Reid	
19	24-Mar-26	Tuesday	Blood cancers & Lymphoma	Leandro Venturutti	Reid	Paper summary 4
20	26-Mar-26	Thursday	Cancer cell signaling	Will Lockwood	Reid	
21	31-Mar-26	Tuesday	Cervical cancer	Gina Ogilvie	Reid	
22	02-Apr-26	Thursday	Carcinogens/environmental causes of cancer	Emilia Lim	Reid	
23	07-Apr-26	Tuesday	PDF/PhD students present academic path/next steps		Evgin	
24	09-Apr-26	Thursday	Oral presentations		TEAM MEDG421	Oral paper summary

Colour coding
Theme 1: What is cancer?
Theme 2: How do we study cancer?
Theme 3: How do we treat cancer?
Theme 4: In depth: cancer features
Theme 5: In depth: types of cancer